THE RESPONSE OF TL INTERBANK RATES TO WEEKLY MONEY SUPPLY ANNOUNCEMENTS WITHIN THE FRAMEWORK OF MARKET EFFICIENCY

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I certify that this thesis is satisfactory for the award of the degree of Master of Arts.

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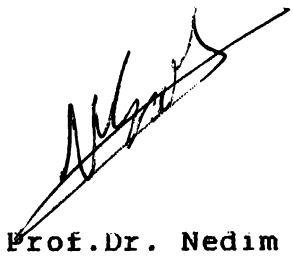

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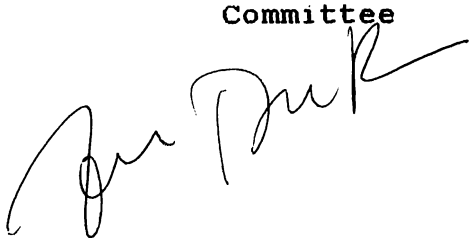

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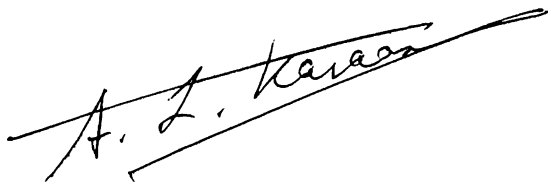

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ABSTRACT

THE RESPONSE OF TL INTERBANK RATES TO WEEKLY MONEY SUPPLY ANNOUNCEMENTS WITHIN THE FRAMEWORK OF MARKET EFFICIENCY

In this study,the effects of weekly money supply announcements on changes in TL interbank rates is tested in terms of market efficiency. As a result of the model tested, Turkish interbank market appeared to be an inefficient financial market. During this study, ARIMA based generated money supply survey data is used. Therefore a joint hypothesis, market efficiency and effectiveness of ARIMA based survey data, is tested. This leads to a weak rejection of market efficiency in TL interbank market.

Key words: Money suppiy annoucements, interbank rates, anticipated component of money supply announcement, unanticipated component of money supply announcement, market efficiency hypothesis.

OZET

FINANSAL PIYASALARIN VERIMLILIGI CERCEVESINDE HAFTALIK PARA STOKU DUYURULARIN BANKALARARASI TL PARA PIYASASI FAIZ HADLERINE ETKISI

Bu calismada, para stoku duyurularinin bankalar arasi TL para piyasasi faiz hadlerine olan etkisi finansal marketlerin verimliligi hipotezi altinda test edilmistir. Sonuc olarak bankalararasi TL para piyasasinin verimliligi red edilmistir. Bu calismada, zaman serileri metoduyla para stoku tahminleri hesaplanmis ve modelde para stoku anket verisi olarak kullanilmistir. Bu durumda finansal marketlerin verimliligi ve para stoku anketlerinin ARIMA tabanli tahmin sonuclariyla gosteriminin etkenligi birlikte test edilmistir. Bu baglamda, bu calismanin kapsaminda bankalararasi TL para piyasasini verimliligi hipotezi zayif anlamda red edilmistir.

Anahtar keiimeler: Para stoku anonslari, bankalararasi para piyasasi faiz hadleri, beklenen para stoku, beklenmeyen para stoku, marketlerin verimliligi hipotezi.

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INTRODUCTION

The purpose of this study is to model and examine the effects of money supply announcements on T.L. Interbank rates within the framework of market efficiency. In recent years the effects of money supply announcements on interest rates have been studied extensively. It is widely accepted that the announcement of an unexpectedly large growth in the money supply leads to an immediate increase in short term interest rates. Several alternative theories in the existing empirical literature have been constructed to explain this relation. In this study, rather I focus on market efficiency concept, since it will be interesting to examine this concept within the conditions of a newly emerging financial market, such as the Interbank market in Turkey.

In the first section, a survey of the conceptual basis of the study will be presented.Second section includes a survey of the empirical literature, about the effects of money supply announcements on financial asset markets. This provides the theoretical background of my study and gives a broader view on areas of further research. Third section introduces the empirical work.In section four the model is presented and the expected results are pointed in econometric terms. Section five summarizes the empirical findings and gives interpretation on these results. The last section includes conclusion of the study.

I. CONCEPTUAL BASIS :

I.1) Interbank Market in General

In this market banks borrow and lend excess reserves, balances held by bank at the Central Bank in excess of those required, to each other.

Interbank funds are a direct claim to a deposit at the Central Bank that is they are funds held for member banks in the Central Bank that can be used to satisfy reserve requirements.

Most sales of funds are made on an overnight basis, but there are longer maturities. Overnight transactions in this market provide the purchasing bank with a cheap source of money and a convenient way to make sizeable day to day adjustments in its reserves. For the selling bank, the funds sold provide a convenient form of liquidity, since it has the flexibility to adjust to daily swings that occur in its reserve positions.

Four types of banks deal in this market. First there are sellers. These are the smaller suburban banks that primarily deal with correspondents. When they have an excess balance at hand, usually deposit at their correspondent bank, they ask their correspondent to buy them. The correspondents usually do by the funds as a service to their customers. Because of the passive nature of this purchase, the buying banks are referred to as "intermediaries". Intermediaries generally carry a deficit balance in their reserve accounts equal to the amount of funds they expect to purchase from their customer banks. If the amount received is greater than expected, the intermediaries put out the

difference to their own correspondent banks.

The buyers are primariiy those banks that actively search out for these funds as a permanent source of funds and carry large deficit positions in their purchases of funds. These banks have the pulse of the market and basicaily determine the rate at which funds are traded.

The last group is designated as balancers or arbitragers. Aithough these banks are of medium size to large, they do not operate in great volumes in this market or conduct a large enough correspondent business to generate sufficient funds to be considered as intermediaries. However their management is sophisticated enough to tightly control their reserve position daily so that they can play on both sides of the market as arbitragers(The Money Market, Marcia, Stigum).

The interbank rate is set by supply and demand conditions that exist in the market. However the most important factor in the market as a whole is the Central Bank itself. Through the way it conducts its open market operations, the Central Bank can fairly accurately control the excess reserves in the banking system in Turkey.

In conducting open market operations, the Central Bank aims at controlling the interbank rate because the rate piays a very important role in the short term operating procedures that the Central Bank follows to achieve its longer term objectives of monetary control and economic stimulus. Therefore, banks must follow very closely what Central Bank is doing with respect to the interbank rate and try to anticipate its actions in order to foresee the direction in which the rate can be expected to move in

the future.

I.2) Money Supply Announcements

The effect of money on the ex ante real interest rate is an issue that has attracted attentions of economists for decades. There is a debate in this area since the empirical studies designed to measure the impact of monetary policy on the real rate are inconclusive. The reason is that; money, prices and interest rates as well as Central Bank policy are all endogenous variables and this fact precludes formation of an appropriate structural model that is acceptable for all researchers . In this respect, money supply announcement comes to the picture. Money supply announcements present a unique opportunity for researchers since they are absolutely exogenous variables unlike the actual money supply. On each thursday afternoon money supply figure is announced by the Central Bank. At the time it is announced, the reported figure does not depend on the Central Bank policy, asset prices, or inflation. This means that if significant correlations are found between money supply announcements and changes in interbank rates and over asset prices, the causal relation must run from the announcement to asset prices rather than vice versa. Indeed within the concept of Rational Expectations the unanticipated weekly change in M1. may be interpreted as an exogenous variable, that causes financial variables to change after the announcements of M1 (Cornell, 1983). Moreover, by working with MSA (Money Supply Announcements) rather than actual money supply the observation interval is greatly reduced. The long observation interval is necessary to produce reliable estimates of

the expected and unexpected change in money. Whereas the observation interval of from 2 hours to 1 trading day at most is required to study the effects of money supply announcements on interest rates.

Announcement phenomenon is important and must be studied at this point. Announcements cause no change in the quantity of money, the only thing that changes with announcement is the information set of public and so are their anticipations.

The article[1] written by Nicholas, Small and Webster proposes that a complete analysis of the announcement effect must examine the link between information and interest rates as well as that between money and interest rates. Since interest rates change in accordance with the announcements and the money supply does not, the new information in the announcement must cause money demand to change through anticipation mechanism of people. This concept brings us to concept of market efficiency.

1 O.A. Nichols, D.H. Small, C.E. Webster "Why Interest Rates Rise When an Unexpectedly Large Money Stock is Announced"(1983)

I.3) Market Efficiehcy Hypothesis

Efficient market theory is essentiaily a subset of the rational expectations theory. The rational expectations states that, in a competitive world, economic agents wiil expioit ali available information to take advantage of any perceived profit opportunities. Rational Expectations Hypothesis implies that agents do not make systematic mistakes in forecasting the future and that the drive for profit wili tend to eliminate any obvious opportunities for abnormal gain. Individual hoid rational expectations with respect to a variabie if his prediction is the same as the variable's mathematical expected vaiue, conditionai on an information set containing aii publicly available information. Market efficiency hypothesis as a natural extension of Rational Expectation Hypothesis, states that prices in a market fully reflect all available information.

While investigating the relation between money supply announcements and interbank rates the constraints imposed by market efficiency should not be ignored since financial markets display rational expectations. The evidence supporting market efficiency is quite strong and recent work indicates that a failure to impose financial market efficiency can lead to misleading results.

The term "efficiency" refers to how successful the market is in establishing new prices, success being defined in terms of whether the market incorporates all new information related with prices in a rapid and unbiased manner. The price mentioned within the framework of this study is the price of money, i.e. interbank

rates. Efficiency therefore refers to the two aspects,the speed and quality, of adjustment to new information, which in our case is the money supply announcement, Obviously; if the market were deficient in terms of the speed or quality of its reaction, the informed and alert observer would have little difficulty in profiting from the situation, i.e arbitraging.

In the literature, a distinction is made between three potential levels of efficiency, each level relating to a specific set of information which is increasingly more comprehensive than the previous one.

a) Weak Efficiency

The market is efficient in the weak sense if prices fully reflect the information implied by all prior price movements. Price movements in effect are totally independent of previous movements, impling the absence of any price put terns. Prices would respond only to new information or to new economic events.

b) Semi strong Efficiency

The market is efficient in the semi strong sense if prices respond instantaneously and without bias to newly published information, whether or not the wars of information might differ amongst themselves about the significance of new data, the implication is that the prices that are actually arrived at in such a market would invariably represent the best interpretation of information.

c) Strong Efficiency

The market is efficient in the strong sense if prices fully reflect not only published information but all relevant in information including data not yet publicly available. If the market were strongly efficient, therefore, even an insider would not be able to profit from his privileged position.

These three levels are not independent of each other. For the market to be efficient in the semi strong sense it must also be efficient in the weak sense.

The empirical results indicate that the weekly money supply announcements do in fact contain information. Thus the informational content of money supply announcements must be investigated to understand the anticipations of economic agents about interest rates and efficiency of interbank market (which is relevant for the determination of interest rates).

The rationality of expectations does not preclude the possibility that the monetary authority may try to "fool" the market to carry out some economic objective. It only implies that the market forms unbiased expectations of economic variables. However, this implies that the market would utilize any information contained in serially correlated forecast errors. Thus the market would learn and respond to any systematic policy action. Thus the effect of the surprise component on interest rates should reflect the system's techniques of operation (or policy rule) in implementing monetary policy. "Rational" response of interest rates to the monetary announcements is taken in the sense of correctly incorporating the policy rule in operation.

Institutional structure and sequence of events surrounding announcement procedure is useful to clarify information processing and anticipation mechanism of economic agents participating in interbank market.

II. LITERATURE SURVEY

In recent years, the effect of money supply announcement on interest rates has been studied extensively (Cornell 1979, 1983, Urich and Watchell, 1981, 1984, Roley 1983, Grossman 1981). The impact of unanticipated movements in money on stock returns (Pearce and Roley 1983, 1985 and Lynge 1981) and on foreign exchange rates has also been investigated (Hardouvelis 1984, Cornell 1982, Engel and Frienkel 1984). Generally these studies find that the anticipated component of money supply announcement has no effect on capital market prices. On the other hand, unanticipated changes in money generate an interest rate response in the same direction that is both significant and prompt. Additionally signalling models have been advanced in the literature to explain the reaction of interest rates to money announcement surprises (Cornell 1983,Siegel 1985 and Nicholas, Small and Webster 1983). In Cornell's case, money surprises are a signal about future real activity. In Siegel's model, the announced money supply reveals information about both the current and future states of real economic activity. Nicholas, Small and Webster argue that when announced money exceed expectations, this is a signal that future money demand will be higher. this being the case they argue that interest rates will rise in response, if

investors believe that the shock to money demand will dissipate more slowly than an equally large shock to money supply.

The paper published by Cornell (1983) namely "The Money Supply Announcement Puzzle:Review and Interpretation" presents on excellent review and summary of existing theories. Generally I referred to that article while preparing the literature survey section.

1) The Expected Inflation Hypothesis:

The most obvious link between money announcements and short term interest rates is through expected inflation. The hypothesis is that announcement of an unanticipated jump in the money stock ieads to expectations of higher inflation and thus to an increase in interest rates, while announcement of an unanticipated drop in money has the reverse effect. One requirement of the expected inflation approach is that prices respond quickly to changes in money. If prices take several months to respond, their rational agents would not alter then short run inflation forecasts on the basis of a money supply announcements and rates of return on short term assets like treasury bills would not be affected. Because of its very short term nature, overnight interbank rate is almost certainly unaffected by inflationary expectation. Indeed this issue was empirically tested by T.Urich and P.Watchell(1984)* and they argue that only policy anticipations resulted from money supply announcements are effective on the change in interbank rates and no significant relation is found between inflationary expectations (announcements of consumer and producer price index) and change in interest rates. Several empirical studies were

* The effects of Inflation and Money Supply announcements on Interest Rates"(1984)

conducted to examine the effects of money supply announcements and asset markets. To summarize, the expected inflation hypothesis predicts that in response to an unexpected increase in the money supply :(i) short-term interest rates will rise, (ii)long term rates will rise, but the increase will be less than short term rates unless the expected inflation changes permanently; (iii) the domestic currency will depreciate against other major currencies (iv) Stock prices may move up or down depending on the role of taxes, nominal contracting by firms and other markets' imperfections.

2) Keynesian Hypothesis:

A second link between money and asset prices in through the expected real rate. For this link to work, it must first be the case that actual innovations in money affect the ex ante real rate. It's the Keynesian liquidity preference model with sticky prices that posits such a relation.

Money market equilibrium condition $\frac{M}{P} = f(y,i)$

M = The nominal stock of money

P = Price level

Y = The level of income

In Keynesian world prices do not adjust instantaneously to monetary shocks. For this reason interest rate must adjust to bring the money supply and demand into equilibrium. A sudden increase in the supply of nominal money balances causes real money balances to rise because prices are sluggish. To clear money market, the interest rate must fall to produce an offsetting increase in money demand. Since expected inflation will rise, the decline in the nominal rate must be due to a drop in the ex ante real rate. However this liquidity effect is a short run phenomenon. The interest rate starts to return to its initial level as soon as prices begin to adjust. When the adjustment of prices is complete, the interest rate is back at its starting point.

If actual changes in money affect the ex ante real rate, then announced changes will also have an impact if they alter anticipations regarding future monetary authority policy. The most common approach is to assume that the central bank attempts to control the growth rate of monetary aggregates. In this context, an unexpected jump in money stock leads market participants to believe that the Central Bank will have to tighten credit to offset to rise. Because agents anticipate that future tightening will lead to higher rates via the liquidity effect, they bid aggressively for funds and drive up current interest rate. Urich and Watchell(1984) refer to this scenario as the policy anticipation effect and try to make a discrimination between policy anticipations and expected inflation hypothesis.

If the policy anticipation effect is correct, money supply announcements should have a different impact on short term interest rates compared to long term interest rates. There are two possible cases. In the first instance, the anticipated period of monetary restraint is expected to be shortlived. In that case, only the spot rate and nearby forward rates are affected. On the other hand, if the anticipated period of monetary restraint is expected to be prolonged, distant forward rates, and hence longterm rates will fall. The drop occurs because the liquidity effect is short iived and because a prolonged period of monetary restraint will eventually reduce expected inflation. Hardouvelis*(1984) relates the duration of expectation of monetary restraint policy to the credibility of monetary authority among public. This empirical study conducted by him concludes that market participant in USA believes the credibility of Fed in the shortrun but remains suspicious on seriousness of Fed's monetary targets. The policy anticipation hypothesis predicts a different direction in foreign exchange markets from that of inflationary expectations hypothesis. This provides a tool for testing those two hypothesis. According to policy anticipation hypothesis a rise in the ex ante real rate will cause the domestic currency to appreciate. As Dornbush (1976) and Engel and Frankel**(1984)

* G.A. Hardouvelis, "Market Perceptions of Federal Reserve Policy and The Weekly Monetary Announcements"

** C.Engel , J.Frankel "Why Interest Rates Reacts to Money Su Supply Announcements:An Explanation from the Foreign Exchange market

describe, the market perceives the change in the money stock as a transitory fluctuation that monetary authority will reverse in the future so that anticipated future tightening raises today's real interest rate, causes a capital inflow and appreciates the domestic currency. On the other hand, an increase in the ex ante real rate produced by monetary restraint should lead to lower stock prices. First the discount rate rises to reflect the higher real rate. Secondly, expected corporate cash flow will decline if agents believe that an increase in the real rate depresses economic activity.

In summary, the Keynesian hypothesis predicts that in response to announcement of an unexpected increase in the money supply: i) Short-term interest rates will rise, ii) long-term interest rates will either decline or remain largely unaffected depending on whether the period of future monetary restraint is seen as being permanent or transitory, iii) The domestic currency will appreciate against other major currencies and iv) stock prices will decline.

III. CASE STUDY: REPUBLIC OF TURKEY

III.1) TL Interbank Market In Turkey

Until mid eighties, the Turkish Central Bank did not control money stock strictly for monetary policy purposes. Economic policy in general and monetary policy in particular were not based on the belief that the money stock had significant influence on either prices or output. A major constraint on the Central Bank's behavior has been the obligation to finance the government's borrowing requirements. Since virtually no attention had been paid to money stock, an expansion in domestic credit to government sector had not been encountered by any significant squeeze of private sector credit till mid eighties. From that time an Central Bank has put monetary policy in action and tried to construct monetary policy tools to control monetary aggregates. For that reason Central Bank constructed the Interbank market on Apr 2nd, 1986. and started to open market operations on Feb 4th, 1987. Its target has become restriction of near money aggregate, which is M1 while widening less liquid money supply, M2. Among open market operations, reverse repo has been the most frequently applied tool of Central Bank in order to reduce liquidity in the market.

Interbank market was constructed to enhance the reserve movements among the banks and make better utilization of our banking system. Interbank rate is mainly an indicator of liquidity level in the market. On the maturity days of governments bonds in domestic market; on the participation days of several funds and municipals into the interbank market, on the day that Treasury

pays its debt to Ziraat Bankasi etc. the market is highly liquid so interbank rate goes down. Whereas on the wage payment days, on the days that bank have to deposit reserve requirements to Central Bank, just before the religious festivals, on taxation days etc. there is tightening in the liquidity so interbank rate increases.

Development of interbank market can be divided into three periods. Before feb 29 1988, the interbank rates were determined by the free market conditions. Between feb 29 and march 21 1988 Central Bank applied upper and lower limits on the interbank rates to prevent excessive increase or decrease in rates in case of imbalances between supply and demand for reserves in the market. After march 21, 1988 Central Bank installed two sided quotation system among banks in the market besides the old one.

These periods were reflected in the interbank rates. For example, before feb 29, 1988 since rates were formed under free market conditions a rate about 60% might mean a high interbank rate pointing to tightness of liquidity while the same figure might mean a low interbank rate with the introduction of quotations after feb 29.

TL interbank market begins transactions about 10 am and ends transactions about 4 pm on each day. Central Bank exerts substantial power on interbank market and keeps this market as a tool of achieving its monetary policy ends. Central Bank enters the market as a buyer or seller of reserves according to the direction of its monetary policy and makes huge volume of transactions. At the early days of the market, Central Bank used it for controlling the spread between official and free exchange

rates. After the construction of foreign exchange interbank market in 1987, that function was transferred to this new market. A study conducted by U..Erol and M.Altinkemer showed that creation of foreign exchange interbank market eliminated the need to use interbank rates as a tooi to stabilize exchange rate margin especially beginning from 1989. However, Central Bank continues to use TL interbank market directly from time to time for the sake of its policy. Intervention of Central Bank and strict margin of movements on interbank rates highly reduces the movement of that market freely.

III.2) Money Supply Announcement

Turkish Central Bank publishes "Money and Credit Statistics" in "Weekly Bulletin of Central Bank of Turkish Republic" at every thursday in a limited number (around 130). These issues are sent to senior management of all banks and top managers of government agencies. As soon as the bulletins are reproduced in required number, they are available for users. Central Bank organizes the distribution of these issues according to the preferences of users. (Immediate users take the issue directly from Central Bank while others may prefer mail). The reproduction of issues is completed around 2 pm to 4 pm. Moreover the same statistics are included in the "Weekly Press Bulletin", which is also distributed together with the"Weekly Bulletin of TC Central Bank", then press makes these data publicly known.

Central Bank uses lagged reserve accounting system similar to that of USA. The data covers the week ending thirteen days before the thursday announcement, in other words it belongs to the week that is two two weeks before the announcement. This is partially caused by the difficulty of obtaining the required statistics from banks on time.

IV. MODEL

This section presents the emprical model to be tested to determine the efficiency of Turkish interbank market. First the structural model is given and then the data are described.

IV.1) Structural Model

In the previous sections, the Market Efficiency Hypothesis with respect to money supply announcements and interbank rates is discussed in detail As a summary, in an efficient interbank market, interbank rate should already embed the anticipated part of announced M1 and only the unanticipated, or the surprise, part should have an effect through the revision of market participants' anticipations. If the announced M1 is not surprisingly different from that inferred by the participants there is no need to revise future policy rule anticipated and change the current behaviour.

Reffering to Miskin*(1982), the theory of rational expectations (or, equivalantly efficient markets theory) indicates that interest rates in a bond market should reflect all available information. Market uses available information correctly in assesing the probability distribution of all future interest rates.

* F.S. Miskin "Monetary Policy and Short-Term Interest Rates: An Efficient Markets-Rational Expectations Approach"

$E_m(r_t / I_{t-1}) = E(r_t / I_{t-1})$

r_t = Interest rate at time t

I_{t-1}= Information available at time t-1

$E(.../I_{t-1})$ = The expectation conditional on I

$E_m(.../I_{t-1})$ = The market's expectations (unbiased forecast) assessed at t-1

Denoting the market's one period ahead forecast of the shortrate as r_t^e $(=E_m(r_t / I_{t-1}))$,

$$E(r_t - r_t^e / I_{t-1}) = 0$$

The above equation states that the forecast error for short rates should be uncorrelated with any linear combinations of information in I_{t-1}. An equivalent representation of the rational expectations model which satisfies above requirements is

$$r_t - r_t^e = (X_t - X_t^e) + t$$

X_t = Variable of information relevant to the determination of shortterm interest rates.

X_t^e= Market's expectations conditional on past information about X_t.

= A Coefficient vector

$_t$= Serially uncorrelated error process

This model stresses that an unanticipated change in the short rate will occur only when unanticipated information hits the market. In order to make the model empirically testable, Mishkin

introduces one-period-ahead forward rates into the model. Considering interbank market, the difference in interbank rates just before to just after the announcement shows the revision of market anticipation on interbank rate related to the information embedded in money supply announcements on thursday.

The regression equation to be tested in this model is

$$r_t^A - r_t^B = a_0 + a_1 * M1_t^e + a_2 * (M1_t - M1_t^e)$$

r_t^A = Interbank rate after the announcement

r_t^B = Interbank rate before the announcement

$M1_t$= Actual money supply, M1 announced.

$M1_t^e$= Anticipated money supply, M1 forecasted.

With a more compact representation

$$R_t = a_0 + a_1 * (M1FRC)_t + a_2 * (M1SURP)_t$$

The money supply announcements are decomposed into anticipated and unanticipated components to test the efficient market hypothesis that only the unanticipated components should affect rates.

M1FRC is the series of anticipated money supply.

M1SURP is the series of unanticipated supply

Our null hypothesis pointing efficiency of TL interbank market are $a_1 = 0$ and a_2 0 statistically.

As suggested by Grossman(1981), the effect of M1SURP on changes in interenst rate should reflect, under rational expectations, the anticipated policy response to the monetary surprise. Since the Central Bank has essentially no informational advantage over the public with respect to weekly changes in M1, it reacts to the incoming monetary data after they have been released to the public. It is this possible reaction by the Central Bank to the unanticipated change in M1 unanticipated by both Central Bank and the public that triggers the rates response. These are the expected results under rationality of markets.

IV.2) Data

The exogenous variable in my study is the money supply announcements of narrowly defined money supply, M1. It shows the liquidity in the market since it includes currency and near money aggregates. Central Bank revised the definition of M1 and the mentions it in tables as "new narrow definition of money supply". M1 includes the following

. Currency in Circulation

. Demand Deposits

  . Commercial Account

  . Saving Account

. Deposits Held at Central Bank

My data period covers 238 weekly data from JAN 8th 1988 to JUL 24 1992. These are presented in Table IV.2.1.

Money Supply Anticipation data is not readily available as a survey result. In USA, Money Market Services Inc. obtains forecasts of the change in narrowly defined money supply by questioning with about 50 government securities dealers on weekly telephone surveys. As a result of his empirical study on survey expectations, Grossman(1981) pointed out that the survey expectations efficiently utilize all the information in a time series model and in addition contain autonomous (nonextrapolative) information. Unfortunately there is not such a survey service in Turkey. This series was estimated using time series analysis approach. In this study the first 51 observations on M1 announcements were taken as a basis for constructing structural

ARIMA model. The first difference series of announcements was generated to get a stationary series. Autocorrelations for 25 lags and partial autocorrelations for 18 lags were examined and among several alternative models tested the appropriate model was found to be ARIMA (3,1,2). The results given at Appendix A.

After determining the structural model, iterative time series method was applied to ARIMA (3,1,2) model to generate anticipated money supply series. This method proceeded as follows: in order to forecast the anticipated value for a specific week all the previously announced M1 values were taken to information base to revise ARIMA (3,2,1) coefficients. The anticipated value was forecasted with these revised coefficients in the presence of last observation added. The forecasts generated with this method is tabulated in Table IV.2.2.

TABLE IV.2.1

WEEKLY MONEY SUPPLY ANNOUNCEMENTS (TL IN BILLIONS)

Week	M1	Week	M1	Week	M1	Week	M1
1	6770.4	33	8442.6	65	10590.1	97	16896.3
2	6997.1	34	8356.4	66	10760.4	98	17785.1
3	6864.9	35	8359.9	67	10913.3	99	17225.2
4	6711.2	36	8505.1	68	11231.7	100	17175.1
5	6507.6	37	9194.6	69	11613.3	101	17227.3
6	6449.2	38	8941.5	70	11745.5	102	18445.8
7	6684.2	39	8753.5	71	11732.9	103	18073.8
8	6454.1	40	8861.6	72	12234.9	104	20358.3
9	6428	41	9208	73	11903	105	18641.2
10	6438.7	42	8874.1	74	11963.6	106	18426.3
11	6788.5	43	8541.5	75	12153.4	107	19308.2
12	6809.3	44	8264.5	76	12813	108	18480.3
13	6473.9	45	8504.4	77	12548.1	109	18347.6
14	6581.3	46	8740.3	78	12784.3	110	18197
15	7081.2	47	8697.3	79	13070.6	111	19231
16	6990.1	48	8527.6	80	14494.3	112	18632.5
17	6885.8	49	8646.8	81	14113.2	113	18573
18	6642.8	50	9111.9	82	14175.5	114	18512
19	6750.5	51	9044.8	83	14232	115	19951
20	7244.9	52	11243.8	84	14607.4	116	19614
21	7120.8	53	9340.8	85	15410.9	117	19521
22	6974.1	54	9242.4	86	14984.3	118	19632
23	6902.4	55	9517.4	87	14971.5	119	19872
24	7297.3	56	9377.2	88	15138.4	120	22139
25	7301.4	57	9419.6	89	16373.5	121	21963
26	7094.6	58	9640.8	90	16099	122	21133
27	7144.9	59	10217.9	91	16310.6	123	21292
28	8029.1	60	10019.7	92	16235.8	124	22500
29	8228.7	61	10033.5	93	16271.9	125	21566
30	8220.7	62	10356.7	94	17346.1	126	21557
31	8188.2	63	11067.4	95	17092	127	21963
32	8237.5	64	10807.2	96	16786.1	128	23556

TABLE IV.2.1 (CONTINUED)

WEEKLY MONEY SUPPLY ANNOUNCEMENTS (TL IN BILLIONS)

Week	M1	Week	M1	Week	M1	Week	M1
129	22979	162	28792	195	39430	228	49705
130	24653	163	30543	196	39127	229	46469
131	24845	164	29434	197	40148	230	46807
132	24059	165	29314	198	42534	231	50075
133	25240	166	28137	199	40500	232	57525
134	24679	167	30185	200	39353	233	53434
135	24771	168	29490	201	38843	234	50955
136	25341	169	28570	202	42459	235	49436
137	27104	170	28188	203	39676	236	49062
138	26472	171	32310	204	39038	237	56269
139	26238	172	31204	205	38675	238	54219
140	26050	173	29549	206	39598		
141	26712	174	28776	207	41872		
142	26978	175	29440	208	42116		
143	26842	176	31368	209	42533		
144	26470	177	30314	210	39883		
145	26809	178	30088	211	43395		
146	27810	179	30502	212	41401		
147	26819	180	31419	213	39675		
148	26488	181	34904	214	40316		
149	26955	182	33419	215	42362		
150	28192	183	31812	216	43350		
151	26939	184	32579	217	41902		
152	26389	185	34362	218	43803		
153	26365	186	33445	219	43572		
154	26563	187	34078	220	46656		
155	27240	188	34585	221	43716		
156	29326	189	38174	222	46054		
157	29013	190	36357	223	44057		
158	28066	191	35822	224	48118		
159	30507	192	36401	225	46124		
160	29533	193	37455	226	46888		
161	29227	194	39974	227	44585		

TABLE IV.2.2

ANTICIPATED MONEY SUPPLY (M1FRC)

Week	M1FRC	Week	M1FRC	Week	M1FRC
52	8789.585	84	14499.25	116	19545.51
53	11070.03	85	14678.65	117	19535.69
54	11105.64	86	15146.48	118	19549.42
55	9668.046	87	15005.91	119	19971.15
56	10268.66	88	15139.62	120	20098.46
57	9623.745	89	15418.21	121	21089.65
58	9612.197	90	16087.49	122	21497.47
59	9708.686	91	15930.49	123	21390.09
60	10010.88	92	16213.65	124	22000.36
61	9984.911	93	16597.76	125	22611.67
62	10041.13	94	16572.38	126	21694.78
63	10255.42	95	17100.88	127	21588.16
64	10736.17	96	16993.38	128	22239.37
65	10721.83	97	16939.84	129	23094.71
66	10709.09	98	17262.15	130	22759.64
67	10890.67	99	17807.34	131	23877.7
68	10990.14	100	17316.41	132	24916.68
69	11159.44	101	17253.49	133	24483.91
70	11420.56	102	17577.04	134	25229.32
71	11593.23	103	18277.53	135	25003.13
72	11702.08	104	17986.78	136	24891
73	12100.16	105	19262.42	137	25324.45
74	12017.46	106	19446.5	138	26429.48
75	12095.43	107	18833.76	139	26434.96
76	12241.97	108	19652.47	140	26575.88
77	12626.4	109	19060.6	141	26721.63
78	12558.99	110	18648.32	142	26853.18
79	12760.56	111	18514.56	143	26863.21
80	13033.23	112	19046	144	26888.07
81	13985.63	113	18860.31	145	26934.57
82	13975.73	114	18766.58	146	27162.1
83	14172.27	115	18879.55	147	27604.77

TABLE IV.2.2 (CONTINUED)

ANTICIPATED MONEY SUPPLY (M1FRC)

Week	M1FRC	Week	M1FRC	Week	M1FRC
148	27073.39	180	31210.43	212	43232.32
149	26987.65	181	31105.92	213	42275.51
150	27397.68	182	32916.5	214	40121.35
151	27840.67	183	32691.86	215	41547.44
152	27123.58	184	32456.56	216	42306.21
153	27043.66	185	33996.75	217	41884.09
154	27260.6	186	34245.13	218	41601.08
155	26851.56	187	32892.87	219	43953.81
156	26837.75	188	33914.47	220	44122.59
157	28469.04	189	34808.36	221	44956.83
158	28592.68	190	36570.17	222	44249.3
159	28345.84	191	35821.05	223	45553.02
160	30254.43	192	36070.81	224	45971.62
161	29580.22	193	37659.97	225	46067.41
162	29545.12	194	37246.16	226	46800.12
163	29640.94	195	38242.41	227	46064.77
164	30168.82	196	38604.52	228	46981.92
165	29684.14	197	39347.43	229	47869.85
166	29676.14	198	40794.34	230	47736.13
167	29340.45	199	41781	231	45736.34
168	29788.01	200	40248.04	232	50240
169	29661.09	201	40257.15	233	52734.31
170	28966.64	202	40815.74	234	51647.94
171	29322.28	203	41904.69	235	51970.98
172	30822.38	204	39473.93	236	54631.66
173	30343.26	205	39366.9	237	50107.05
174	29984.09	206	40869.65	238	54264.4
175	31093.31	207	40135.17	239	52923.08 *
176	29948.1	208	40216.74		
177	30572.49	209	40879.3		
178	29980.08	210	42256.7		
179	30371.55	211	41427.38		

I obtained daily transaction weighted average settlements of interbank rates covering Jan 1989 to Jul 1992. The change in Interbank rate from just before to just after the announcements is my endogenous variable. Since the hourly interbank rates are not obtainable within a day from Central Bank (even closing and beginning rates), I took the difference between Thursday (announcement day) average and Friday average to reflect the impact of announcement on interest rates. The data on interbank rates are presented in Table IV.2.3.

M1SURP is unanticipated that is the surprise component of M1.

$M1SURP_t$ = $Act.M1_t$ - $M1FRC_t$ (Anticipated)

The M1SURP series is given at Table IV.2.4.

TABLE IV.2.3

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	30		11243.8
friday	34.04	4.04	
thursday	25		9340.8
friday	21.19	-3.81	
thursday	43.41		9242.4
friday	92.22	48.81	
thursday	75		9517.4
friday	40	-35	
thursday	29.84		9377.2
friday	33.47	3.63	
thursday	35		9419.6
friday	33.06	-1.94	
thursday	25		9640.8
friday	29.23	4.23	
thursday	42.19		10217.9
friday	40	-2.19	
thursday	25.34		10019.7
friday	25.8	0.46	
thursday	35		10033.5
friday	36.93	1.93	
thursday	20.22		10356.7
friday	31.88	11.66	
thursday	53.22		11067.4
friday	73.95	20.73	
thursday	43.16		10807.2
friday	45.09	1.93	
thursday	40.07		10590.1
friday	40.11	0.04	
thursday	35.25		10760.4
friday	31.94	-3.31	
thursday	37.28		10913.3
friday	60.05	22.77	
thursday	30.28		11231.7
friday	28.36	-1.92	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	28.11		11613.3
friday	42.55	14.44	
thursday	88.15		11745.5
friday	92.09	3.94	
thursday	73.29		11732.9
friday	87.76	14.47	
thursday	32.71		12234.9
friday	25	-7.71	
thursday	35		11903
friday	39.52	4.52	
thursday	91.87		11963.6
friday	82.06	-9.81	
thursday	37.54		12153.4
friday	41.63	4.09	
thursday	38.38		12813
friday	40	1.62	
thursday	45		12548.1
friday	40	-5	
thursday	36.34		12784.3
friday	40	3.66	
thursday	41.96		13070.6
friday	50	8.04	
thursday	89.88		14494.3
friday	76.39	-13.49	
thursday	39.05		14113.2
friday	32.67	-6.38	
thursday	33.58		14175.5
friday	33.68	0.1	
thursday	41.03		14232
friday	40	-1.03	
thursday	30.25		14607.4
friday	31	0.75	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	49.23		15410.9
friday	57.04	7.81	
thursday	43		14984.3
friday	48.62	5.62	
thursday	55		14971.5
friday	55.42	0.42	
thursday	21.71		15138.4
friday	16.28	-5.43	
thursday	34.78		16373.5
friday	42.61	7.83	
thursday	45.37		16099
friday	39.8	-5.57	
thursday	21.48		16310.6
friday	20.45	-1.03	
thursday	15.18		16235.8
friday	11.61	-3.57	
thursday	17.14		16271.9
friday	36.28	19.14	
thursday	18.61		17346.1
friday	15.18	-3.43	
thursday	20.19		17092
friday	20.17	-0.02	
thursday	25.36		16786.1
friday	26.77	1.41	
thursday	54.23		16896.3
friday	48.87	-5.36	
thursday	54.84		17785.1
friday	53.44	-1.4	
thursday	42		17225.2
friday	43.27	1.27	
thursday	26.2		17175.1
friday	27.97	1.77	
thursday	29.74		17227.3

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
friday	29.76	0.02	
thursday	22.35		18445.8
friday	25.23	2.88	
thursday	23.34		18073.8
friday	23.14	-0.2	
thursday	23.16		20358.3
friday	28.17	5.01	
thursday	22.09		18641.2
friday	24.02	1.93	
thursday	37.78		18426.3
friday	39.92	2.14	
thursday	48.81		19308.2
friday	43.29	-5.52	
thursday	21.21		18480.3
friday	20.2	-1.01	
thursday	33.24		18347.6
friday	38.88	5.64	
thursday	47.78		18197
friday	45.85	-1.93	
thursday	43.93		19231
friday	45.93	2	
thursday	38.47		18632.5
friday	33.97	-4.5	
thursday	41.9		18573
friday	44.91	3.01	
thursday	49.89		18512
friday	46.9	-2.99	
thursday	54.69		19951
friday	52.86	-1.83	
thursday	32.18		19614
friday	27.15	-5.03	
thursday	31.4		19521
friday	41.81	10.41	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	41.94		19632
friday	44.8	2.86	
thursday	47.77		19872
friday	47.93	0.16	
thursday	49.78		22139
friday	53.02	3.24	
thursday	53.7		21963
friday	54.87	1.17	
thursday	52.26		21133
friday	54.33	2.07	
thursday	56.86		21292
friday	56.92	0.06	
thursday	57.79		22500
friday	61.57	3.78	
thursday	56.99		21566
friday	59.52	2.53	
thursday	59.75		21557
friday	59.95	0.2	
thursday	62.67		21963
friday	61.79	-0.88	
thursday	62.29		23556
friday	62.86	0.57	
thursday	58.75		22979
friday	58.2	-0.55	
thursday	61.9		24653
friday	63.68	1.78	
thursday	63.87		24845
friday	63.95	0.08	
thursday	55.07		24059
friday	53.16	-1.91	
thursday	52.05		25240
friday	50.07	-1.98	
thursday	50.08		24679
friday	50.15	0.07	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	48.16		24771
friday	48.87	0.71	
thursday	48.22		25341
friday	50.57	2.35	
thursday	58.94		27104
friday	58.9	-0.04	
thursday	56.67		26472
friday	56.78	0.11	
thursday	59.07		26238
friday	59.78	0.71	
thursday	55.95		26050
friday	53.59	-2.36	
thursday	55.36		26712
friday	56.39	1.03	
thursday	55.21		26978
friday	52.16	-3.05	
thursday	49.23		26842
friday	55.9	6.67	
thursday	53.02		26470
friday	51.06	-1.96	
thursday	50.14		26809
friday	53.14	3	
thursday	52.53		27810
friday	50.19	-2.34	
thursday	50.61		26819
friday	54.04	3.43	
thursday	58.81		26488
friday	58.26	-0.55	
thursday	59.82		26955
friday	59.66	-0.16	
thursday	59.91		28192
friday	59.41	-0.5	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	59.86		26939
friday	59.83	-0.03	
thursday	59.81		26389
friday	59.8	-0.01	
thursday	59.78		26365
friday	58.17	-1.61	
thursday	62.93		26563
friday	62.96	0.03	
thursday	64.94		27240
friday	64.92	-0.02	
thursday	64.94		29326
friday	64.82	-0.12	
thursday	59.23		29013
friday	59.13	-0.1	
thursday	62.87		28066
friday	64.97	2.1	
thursday	64.97		30507
friday	64.97	0	
thursday	64.92		29533
friday	64.88	-0.04	
thursday	64.92		29227
friday	64.92	0	
thursday	64.93		28792
friday	64.96	0.03	
thursday	68.95		30543
friday	68.96	0.01	
thursday	68.86		29434
friday	68.75	-0.11	
thursday	69.75		29314
friday	70.75	1	
thursday	128.15		28137
friday	112.4	-15.75	
thursday	125.07		30185
friday	147.39	22.32	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	60		29490
friday	72.29	12.29	
thursday	115.49		28570
friday	111.73	-3.76	
thursday	110.17		28188
friday	110	-0.17	
thursday	115		32310
friday	120	5	
thursday	120		31204
friday	120	0	
thursday	97.11		29549
friday	96.63	-0.48	
thursday	88.7		28776
friday	86.96	-1.74	
thursday	81.99		29440
friday	80.67	-1.32	
thursday	79.89		31368
friday	79.89	0	
thursday	77.86		30314
friday	77.88	0.02	
thursday	76.82		30088
friday	75.36	-1.46	
thursday	74.82		30502
friday	73.87	-0.95	
thursday	69.62		31419
friday	70.78	1.16	
thursday	70.83		34904
friday	70.9	0.07	
thursday	69.96		33419
friday	68.21	-1.75	
thursday	67.77		31812
friday	67.77	0	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	64.43		32579
friday	65.85	1.42	
thursday	65.75		34362
friday	65.75	0	
thursday	65.75		33445
friday	65.75	0	
thursday	65.75		34078
friday	65.77	0.02	
thursday	61.05		34585
friday	60.04	-1.01	
thursday	60.15		38174
friday	62.19	2.04	
thursday	67.75		36357
friday	67.5	-0.25	
thursday	67.84		35822
friday	0	-67.84	
thursday	64.78		36401
friday	63.8	-0.98	
thursday	61.9		37455
friday	61.92	0.02	
thursday	61.84		39974
friday	61.8	-0.04	
thursday	61.85		39430
friday	61.85	0	
thursday	61.75		39127
friday	61.75	0	
thursday	61.75		40148
friday	61.78	0.03	
thursday	61.84		42534
friday	61.83	-0.01	
thursday	61.91		40500
friday	61.87	-0.04	
thursday	61.75		39353
friday	61.75	0	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	61.75		38843
friday	61.75	0	
thursday	61.86		42459
friday	61.89	0.03	
thursday	61.75		39676
friday	61.75	0	
thursday	60.75		39038
friday	60.75	0	
thursday	59.92		38675
friday	59.96	0.04	
thursday	59.94		39598
friday	59.89	-0.05	
thursday	59.91		41872
friday	59.9	-0.01	
thursday	59.75		42116
friday	59.75	0	
thursday	59.75		42533
friday	59.75	0	
thursday	59.75		39883
friday	59.75	0	
thursday	60.75		43395
friday	60.75	0	
thursday	60.75		41401
friday	60.75	0	
thursday	60.75		39675
friday	60.75	0	
thursday	61.75		40316
friday	62.75	1	
thursday	62.75		42362
friday	63.75	1	
thursday	63.78		43350

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
friday	63.75	-0.03	
thursday	63.75		41902
friday	63.75	0	
thursday	63.75		43803
friday	63.75	0	
thursday	63.75		43572
friday	63.75	0	
thursday	63.75		46656
friday	63.75	0	
thursday	63.75		43716
friday	63.83	0.08	
thursday	63.75		46054
friday	63.75	0	
thursday	63.75		44057
friday	65.75	2	
thursday	66.75		48118
friday	66.76	0.01	
thursday	66.75		46124
friday	66.75	0	
thursday	66.75		46888
friday	66.75	0	
thursday	67.75		44585
friday	67.75	0	
thursday	67.75		49705
friday	67.83	0.08	
thursday	67.83		46469
friday	67.75	-0.08	
thursday	67.75		46807
friday	67.81	0.06	
thursday	68.82		50075
friday	68.92	0.1	
thursday	68.98		57525
friday	68.97	-0.01	

TABLE IV.2.3 (CONTINUED)

	Interbank Rates	Changes in Interbank Rates	Weekly M1 Announc.
thursday	68.75		53434
friday	68.75	0	
thursday	68.25		50955
friday	67.65	-0.6	
thursday	66.75		49436
friday	66.75	0	
thursday	66.77		49062
friday	66.97	0.2	
thursday	66.75		56269
friday	66.75	0	
thursday	66.75		54219
friday	66.38	-0.37	

TABLE IV.2.4

UNANTICIPATED MONEY SUPPLY (M1SURP)

Week	M1SURP	Week	M1SURP	Week	M1SURP
1	2454.215	33	108.1504	65	68.49023
2	-1729.23	34	732.25	66	-14.6894
3	-1863.23	35	-162.180	67	82.58008
4	-150.645	36	-34.4101	68	-99.1503
5	-891.46	37	-1.21972	69	2040.539
6	-204.145	38	955.29	70	873.3496
7	28.60254	39	11.50977	71	-364.470
8	509.2148	40	380.1094	72	-98.0898
9	8.820314	41	22.14941	73	499.6406
10	48.58887	42	-325.859	74	-1045.67
11	315.5703	43	773.7188	75	-137.779
12	811.9805	44	-8.88085	76	374.8398
13	71.03027	45	-207.281	77	1316.631
14	-131.730	46	-43.5390	78	-115.710
15	51.31055	47	522.9492	79	1893.359
16	22.62988	48	-582.140	80	967.3008
17	241.5605	49	-141.310	81	-857.679
18	453.8594	50	-26.1894	82	756.0898
19	324.9404	51	868.7617	83	-550.320
20	139.6699	52	-203.728	84	-232.130
21	532.8203	53	2371.522	85	450
22	-197.160	54	-621.220	86	1779.551
23	-53.8603	55	-1020.19	87	42.51953
24	57.9707	56	474.4395	88	-196.960
25	571.0303	57	-1172.17	89	-525.880
26	-78.3007	58	-713	90	-9.63085
27	225.3096	59	-451.320	91	124.8203
28	310.04	60	716.4395	92	-21.2109
29	1461.069	61	-413.5	93	-418.070
30	127.5703	62	-287.310	94	-125.570
31	199.7695	63	-254.580	95	647.9004
32	59.73047	64	1071.449	96	-785.769

TABLE IV.2.4 (CONTINUED)

UNANTICIPATED MONEY SUPPLY (M1SURP)

Week	M1SURP	Week	M1SURP	Week	M1SURP
97	-585.390	129	208.5703	161	-1831.32
98	-32.6503	130	3798.08	162	-2600.51
99	794.3203	131	502.5	163	194.6484
100	-901.669	132	-879.859	164	814.5586
101	-734.580	133	122.4395	165	1043.789
102	-678.660	134	365.25	166	17.91016
103	-697.599	135	-800.128	167	2201.922
104	388.4395	136	1185.129	168	-381.808
105	2488.25	137	670.5313	169	2533.41
106	543.9609	138	3365.641	170	-1240.82
107	-526.679	139	-213.171	171	1804.699
108	2161.16	140	0.949218	172	-1496.02
109	-721.429	141	330.1914	173	2146.379
110	-353.220	142	-204.968	174	56.58984
111	-753.119	143	2727.84	175	87.87891
112	902.0606	144	1187.59	176	-1479.77
113	-734.820	145	522.4805	177	2723.078
114	-370.140	146	800.5703	178	-1400.85
115	-1539.14	147	1739.66	179	-929.128
116	844.5508	148	-1281	180	4338.66
117	-298.009	149	-895.039	181	7285
118	-1091.09	150	-1414.14	182	699.6914
119	-778.640	151	1643.262	183	-692.941
120	2987.721	152	-2228.69	184	-2534.98
121	381.6191	153	-435.929	185	-5569.66
122	-794.259	154	-691.898	186	6161.949
123	-1208.09	155	-1271.64	187	-45.3984
124	-1653.31	156	1736.828		
125	1419.9	157	1899.262		
126	-258.490	158	1653.699		
127	107.9199	159	-2373.69		
128	130.4492	160	1967.621		

V.EMPIRICAL RESULTS

After running the original regression equation described in earlier part, results indicated high positive autocorrelation Durbin Watson Statistics = 2.70. Cochrane-Orcutt technique was applied to eliminate autocorrelation and the second run resulted in a satisfactory DurbinWatson Statistic (2.0189) the result of this regression is given below;

$$R_t = 2.5556 - 6.452E\text{-}058*(M1FRC)_t - 1.872E\text{-}05*(MISURP)_t$$
$$(3.1158) \quad (-2.3127) \qquad\qquad (-0.0605)$$

The tabulated results are given at Table V.1.1. The unanticipated component is significant in the changes in interbank rates at both 95% and 90% significance levels.* According to this result, the null hypothesis of $a_1 = 0$ - the basic hypothesis of market efficiency - is rejected. Anticipated M1 values are effective on TL interbank rate. This destroys the market efficiency in TL interbank market.

Moreover the null hypothesis that the coefficient of unanticipated component, a_2, is zero cannot be rejected which is another indication of market inefficiency. Market does not respond to monetary surprise.

Empirical results concluded that TL interbank market in Turkey is an inefficient financial market. Indeed this is not a surprise in the presence of indicators pointing in competitiveness of this market because of high Central Bank intervention.

TABLE V.1.1

RESULT OF ECONOMETRIC MODEL

Summary Statistics

Equation : CHINT= a0+a1*(M1FRC)+a2*(M1SURP)				
a0	a1	a2	R^2	D-W
2.5556746	-6.452E-05	-1.872E-05	0.136	2.018993
(3.1158)	(-2.3127)	(-0.0605)		

CHINT : Change in TL interbank rate from before to after the announcement (fri.avg-thr.avg)

M1FRC : Anticipated money supply

M1SURP : Unanticipated money supply

R^2 : R-squared value of regression

D-W : Durban Watson Statistic

Note : t-statistics are givenin parentheses

Let's make a broader interpretation on these results. Indeed there are few well functioning interbank money markets in developing countries. But efficient monetary policy implementation and domestic resource allocation necessitate interbank borrowing and lending. Without an efficient way of lending among themselves, banks may be affected differently by the same monetary policy measure. The speed of responses to monetary policy actions may also depend in part on the efficiency of the interbank money market. Reasons for nondevelopment include (a) Taxation of all financial transactions, making very short term overnight borrowing and lending, totally uneconomical (b) The discount facilities of Central Bank that provide inexpensive and unlimited loans to banks in need of funds (c) Interest rate ceiling that prevent banks from negotiating terms of interbank loans (d) Insufficient penalties for shortfalls in required reserves.

Interbank market is a newly emerging market in Turkey and banks have not been yet accustomed to this kind of transactions although participation increases. Bankers regard borrowing from another bank as a sign of weakness.

Central Bank intervention to this market is highly resulted from the fact that the market for open market operations is also new and insufficient alone to adjust liquidity. So Central Bank prefers to use both open market operations and interbank market together for its monetary policy ends. Its controls interbank rates tightly.

* For 182 degrees of freedom the critical t-values are 1.645 and 1.282 for 95% and 90% significance levels respectively.

In Turkish banking system, besides reserve requirement for banks Central Bank obligates them to hold extra liquidity (in Turkey it is called disponabiiity ratio). Banks hold it as bond portfolio. Money suppiy announcements have not much effect since the choices of banks to provide their reserve requirements are limited due to the lack of second hand bond market in Turkey.

Central Bank is not independent since it is obligated to give government domestic debt. The political attitudes affect Central Bank policies a lot and force Centrai Bank to go out of its monetary targets for the sake of meeting its obligation to government. This makes Central Bank policies unpredictabie even to it self. Hardouveiis (1984) points out two main hypothesis that have been advanced in the literature to explain reaction of short term interest rates. They differ in their interpretation of the informational content of the unanticipated component of M1. The first hypothesis presumes that markets perceive the unanticipated shock in M1 as a persistent money demand shock. Under this hypothesis money supply shocks are perceived as temporary because the monetary authority has credibility i.e. market expects Centrai Bank to stick to its M1 targets and not allow persistent deviations from these targets. A persistent positive money demand shock that will not be validated, together with the assumption that prices are rigid in the short run leads market participants to expect an increase in future reai short term interest rates. This drives real short term interest rates up immediately after the announcement. This is caiied the "expected iiquidy hypothesis".

The second hypothesis presumes that the unanticipated component of M1 is interpreted as a persistent shock on the growth rate of the money supply. The Central Bank lacks credibility in the market, i.e. markets do not expect the central bank to counteract a shock in the banking system that affects the growth rate of the money supply. This, together with the assumption that prices are flexible in the short run, leads to a change in the inflation premium embodied in short -term interest rates. This is the "inflation premium hypothesis".

In Turkey, it is most likely that market participants do not believe in the credibility of Central Bank since the actions of Central Bank seem to depend highly on political considerations and is not understand able and easily predictable. The movements of Central Bank is highly complicated and surprising to the market.

VI. CONCLUSION

In this study, I have tested the efficiency of TL interbank market with respect to narrowly defined money suppiy announcements. In an efficient market, it is expected that oniy the unanticipated component of money suppiy announcements is effective on changes in interbank rates. In other words, rates respond oniy to monetary surprises, in a way which correctly incorporates the policy ruie in operation.

Considering the Turkish case the TL interbank faiied to be an efficient market as a result of my empirical study, since unanticipated component resulted to be significant on the changes in interest rates. There are several reasons for that result mainly high Central Bank intervention to the market, so this becomes a source of arbitrage. Moreover, as a newly emerging market, TL interbank market has several structural deficiencies causing inefficiency such as tight ceilings on interbank rates.

In order to achieve better utilization of our financial system, interbank market must function in an efficient manner.

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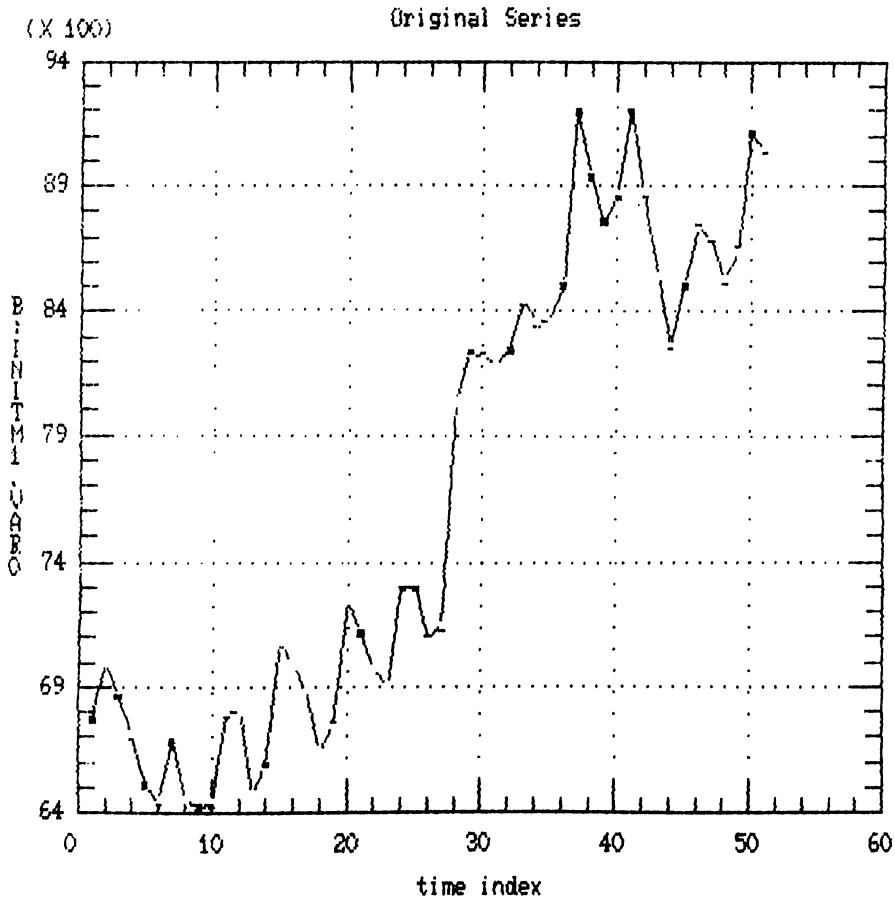
Variable: B:INITM1.VAR0 (length = 51)

(1) 6770.4	(19) 6750.5	(37) 9194.6
(2) 6997.1	(20) 7244.9	(38) 8941.5
(3) 6864.9	(21) 7120.8	(39) 8753.5
(4) 6711.2	(22) 6974.1	(40) 8861.6
(5) 6507.6	(23) 6902.4	(41) 9208
(6) 6449.2	(24) 7297.3	(42) 8874.1
(7) 6684.2	(25) 7301.4	(43) 8541.5
(8) 6454.1	(26) 7094.6	(44) 8264.5
(9) 6428	(27) 7144.9	(45) 8504.4
(10) 6438.7	(28) 8029.1	(46) 8740.3
(11) 6788.5	(29) 8228.7	(47) 8697.3
(12) 6809.3	(30) 8220.7	(48) 8527.6
(13) 6473.9	(31) 8188.2	(49) 8646.8
(14) 6581.3	(32) 8237.5	(50) 9111.9
(15) 7081.2	(33) 8442.6	(51) 9044.8
(16) 6990.1	(34) 8356.4	
(17) 6885.8	(35) 8359.9	
(18) 6642.8	(36) 8505.1	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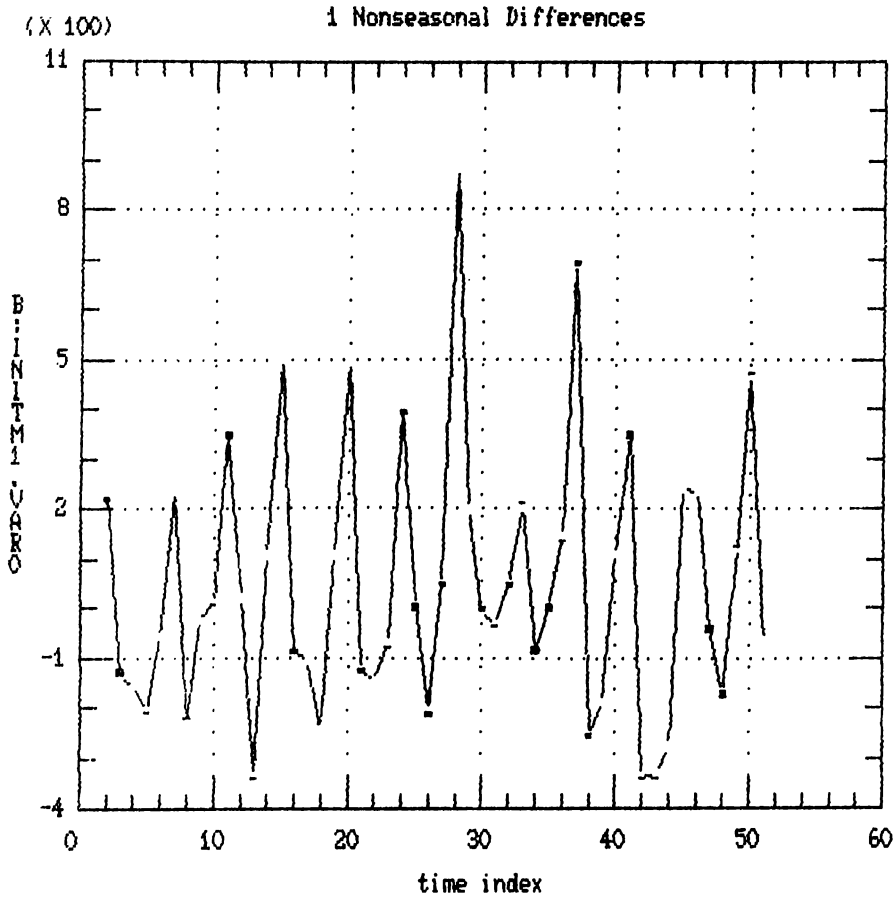
time index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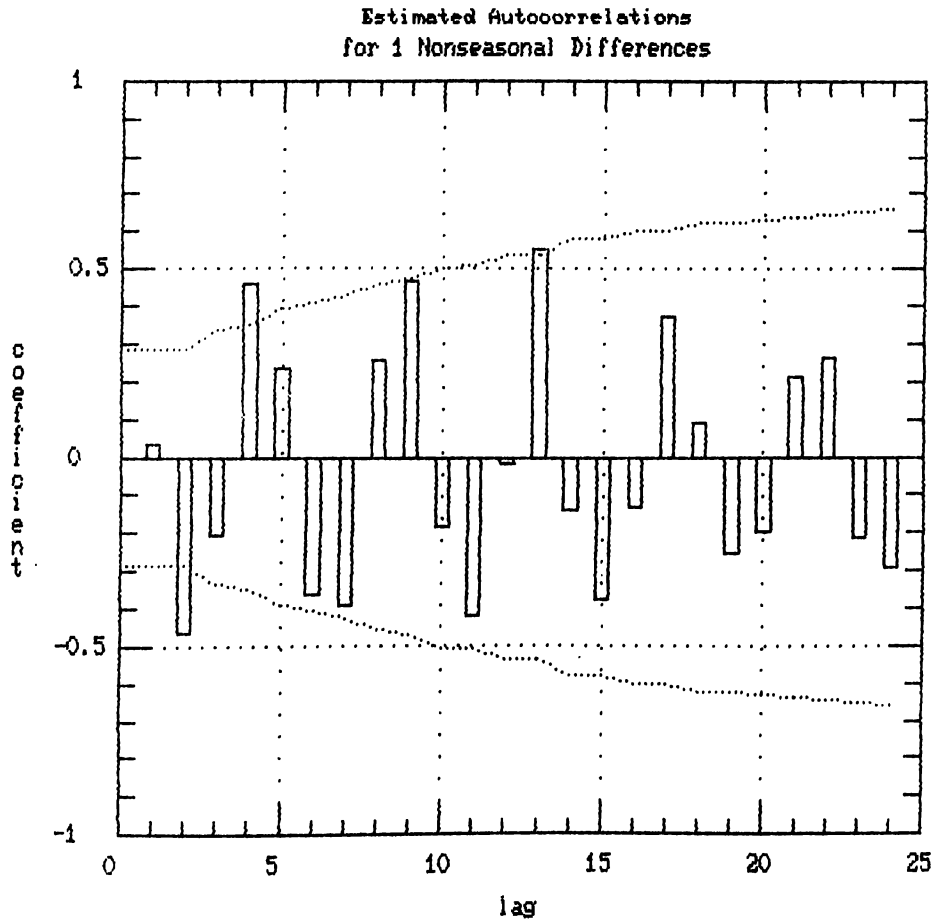
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-1
coefficient
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5
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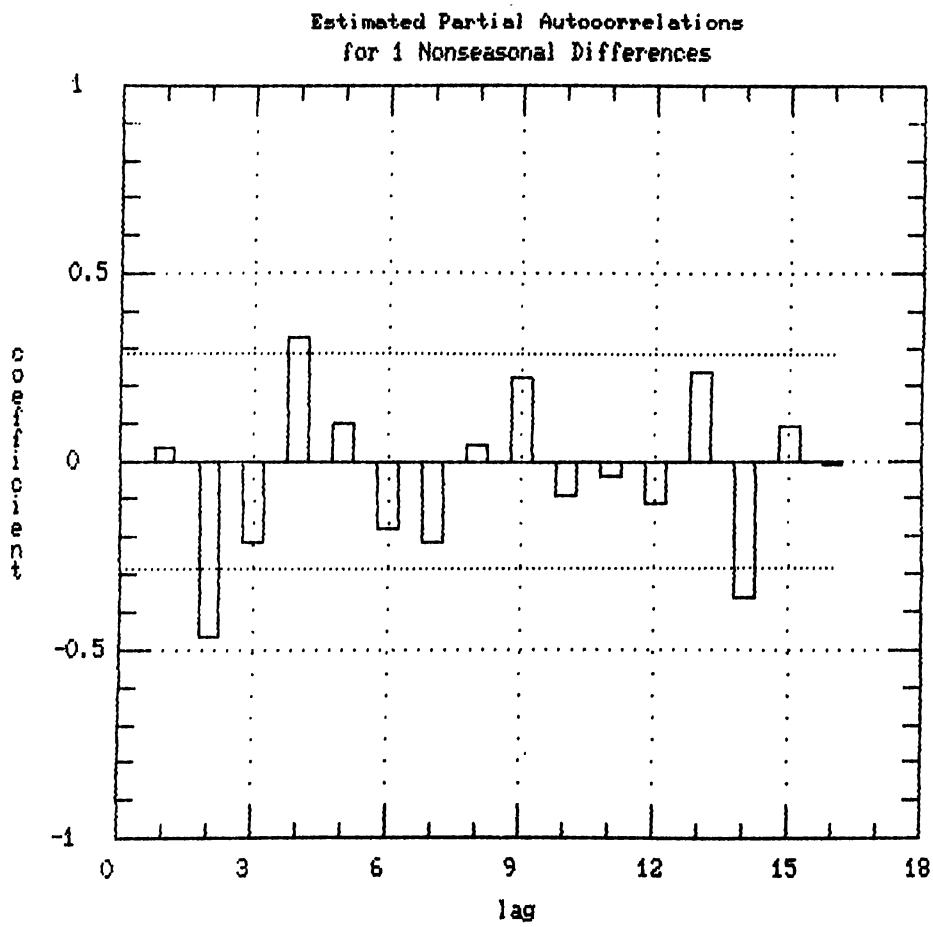
15
20
25
lag


Estimated Partial Autocorrelations
for 1 Nonseasonal Differences
1
0.5
0
-0.5
-1
coefficient
0
3
6
9
12
15
18
lag

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	.03454	.14452	.23899	.81213
MEAN	45.52355	39.48409	1.15296	.25464
CONSTANT	43.95122			

Model fitted to differences of order 1
Estimated white noise variance = 72770.9 with 48 degrees of freedom.
Estimated white noise standard deviation (std err) = 269.761
Chi-square test statistic on first 20 residual autocorrelations = 101.326
with probability of a larger value given white noise = 3.07865E-13
Backforecasting: no Number of iterations performed: 1

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	.05761	.12838	.44873	.65569
AR (2)	-.49064	.13179	-3.72279	.00053
MEAN	43.51887	23.97326	1.81531	.07586
CONSTANT	62.36401			

Model fitted to differences of order 1
Estimated white noise variance = 57292.1 with 47 degrees of freedom.
Estimated white noise standard deviation (std err) = 239.358
Chi-square test statistic on first 20 residual autocorrelations = 33.2716
with probability of a larger value given white noise = 0.0154709
Backforecasting: no Number of iterations performed: 2

41.8043

Final: RSS = 1.85523E6 ...stopped on criterion 2

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	.22046	.03906	5.64470	.00000
AR (2)	-1.01881	.03939	-25.86616	.00000
MA (1)	.24577	.15695	1.56590	.12454
MA (2)	-.88566	.12122	-7.30620	.00000
MA (3)	.08713	.16168	.53889	.59268
MEAN	41.83757	24.75820	1.68985	.09813
CONSTANT	75.23863			

Model fitted to differences of order 1
Estimated white noise variance = 42164.4 with 44 degrees of freedom.
Estimated white noise standard deviation (std err) = 205.34
Chi-square test statistic on first 20 residual autocorrelations = 13.1005
with probability of a larger value given white noise = 0.594532
Backforecasting: no Number of iterations performed: 9

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	-.27641	1.32921	-.20795	.83625
AR (2)	-.90379	.28333	-3.18987	.00266
AR (3)	-.51009	1.33960	-.38078	.70524
MA (1)	-.23270	1.37132	-.16969	.86605
MA (2)	-.78153	.32855	-2.37875	.02188
MA (3)	-.33246	1.21796	-.27296	.78619
MEAN	41.69344	25.59266	1.62912	.11059
CONSTANT	112.16748			

Model fitted to differences of order 1
Estimated white noise variance = 42797.5 with 43 degrees of freedom.
Estimated white noise standard deviation (std err) = 206.876
Chi-square test statistic on first 20 residual autocorrelations = 12.1287
with probability of a larger value given white noise = 0.595967
Backforecasting: no Number of iterations performed: 8

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	-.10543	1.38285	-.07624	.93959
AR (2)	-.83734	.25385	-3.29858	.00199
AR (3)	-.36725	1.38058	-.26601	.79153
AR (4)	.10177	.22090	.46069	.64740
MA (1)	-.08124	1.38152	-.05880	.95339
MA (2)	-.76676	.30758	-2.49285	.01670
MA (3)	-.23496	1.22701	-.19149	.84906
MEAN	41.29981	27.79407	1.48592	.14477
CONSTANT	91.20020			

Model fitted to differences of order 1
Estimated white noise variance = 43647.5 with 42 degrees of freedom.
Estimated white noise standard deviation (std err) = 208.92
Chi-square test statistic on first 20 residual autocorrelations = 12.0994
with probability of a larger value given white noise = 0.519508
Backforecasting: no Number of iterations performed: 8

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	-.44187	.72501	-.60946	.54550
AR (2)	-.85949	.15420	-5.57375	.00000
AR (3)	-.68842	.73240	-.93995	.35262
MA (1)	-.42012	.72954	-.57586	.56778
MA (2)	-.76901	.27488	-2.79764	.00774
MA (3)	-.51330	.66956	-.76663	.44759
MA (4)	-.05295	.18600	-.28467	.77729
MEAN	41.37595	27.29493	1.51588	.13704
CONSTANT	123.70488			

Model fitted to differences of order 1
Estimated white noise variance = 43640.7 with 42 degrees of freedom.
Estimated white noise standard deviation (std err) = 208.904
Chi-square test statistic on first 20 residual autocorrelations = 11.775
with probability of a larger value given white noise = 0.546179
Backforecasting: no Number of iterations performed: 9

```
Iteration 5: RSS = 1.88831E6  b = 0.236701 -1.01111 0.228526 -0.885043 41.1807
Iteration 6: RSS = 1.86324E6  b = 0.233384 -1.01877 0.216974 -0.856231 41.4862
Final:       RSS = 1.86272E6   ...stopped on criterion 2
```

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	.23440	.03551	6.60089	.00000
AR (2)	-1.02346	.03663	-27.93928	.00000
MA (1)	.21613	.10843	1.99331	.05231
MA (2)	-.86765	.11221	-7.73208	.00000
MEAN	41.27539	26.47825	1.55884	.12604
CONSTANT	73.84430			

```
Model fitted to differences of order 1
Estimated white noise variance = 41393.8 with 45 degrees of freedom.
Estimated white noise standard deviation (std err) = 203.455
Chi-square test statistic on first 20 residual autocorrelations = 14.8846
     with probability of a larger value given white noise = 0.533107
Backforecasting: no                                Number of iterations performed: 7
```

```
     11 42.0463
Final:       RSS = 1.85431E6   ...stopped on criterion 2
```

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	.09694	.21279	.45555	.65095
AR (2)	-.99267	.07125	-13.93273	.00000
AR (3)	-.12152	.19550	-.62156	.53744
MA (1)	.12712	.16361	.77694	.44135
MA (2)	-.87939	.13356	-6.58436	.00000
MEAN	42.07072	24.89879	1.68967	.09817
CONSTANT	84.86716			

```
Model fitted to differences of order 1
Estimated white noise variance = 42143.4 with 44 degrees of freedom.
Estimated white noise standard deviation (std err) = 205.289
Chi-square test statistic on first 20 residual autocorrelations = 12.6151
     with probability of a larger value given white noise = 0.632
Backforecasting: no                                Number of iterations performed: 8
```

```
     11 42.0463
Final:       RSS = 1.85431E6   ...stopped on criterion 2
```

Summary of Fitted Model for: B:INITM1.VARO

Parameter	Estimate	Stnd.error	T-value	P-value
AR (1)	.09694	.21279	.45555	.65095
AR (2)	-.99267	.07125	-13.93273	.00000
AR (3)	-.12152	.19550	-.62156	.53744
MA (1)	.12712	.16361	.77694	.44135
MA (2)	-.87939	.13356	-6.58436	.00000
MEAN	42.07072	24.89879	1.68967	.09817
CONSTANT	84.86716			

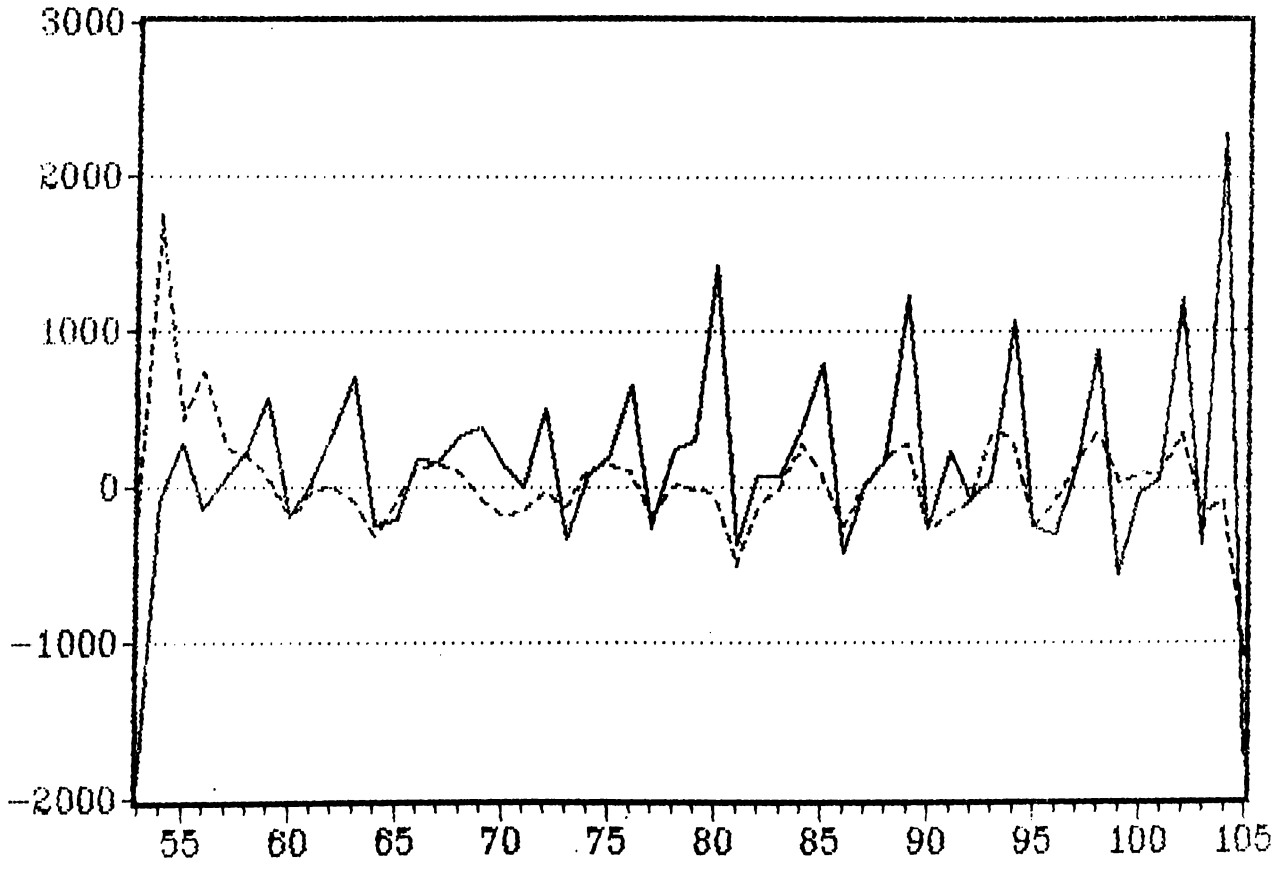
```
Model fitted to differences of order 1
Estimated white noise variance = 42143.4 with 44 degrees of freedom.
Estimated white noise standard deviation (std err) = 205.289
Chi-square test statistic on first 20 residual autocorrelations = 12.6151
     with probability of a larger value given white noise = 0.632
Backforecasting: no                          Number of iterations performed: 8
```

Residual Summary

```
Number of observations = 50
Residual average = 1.52292
Residual variance = 42143.4
Residual standard error = 205.289

Coeff. of skewness = 0.525647   standardized value = 1.51741
Coeff. of kurtosis = 0.867734   standardized value = 1.25247
```

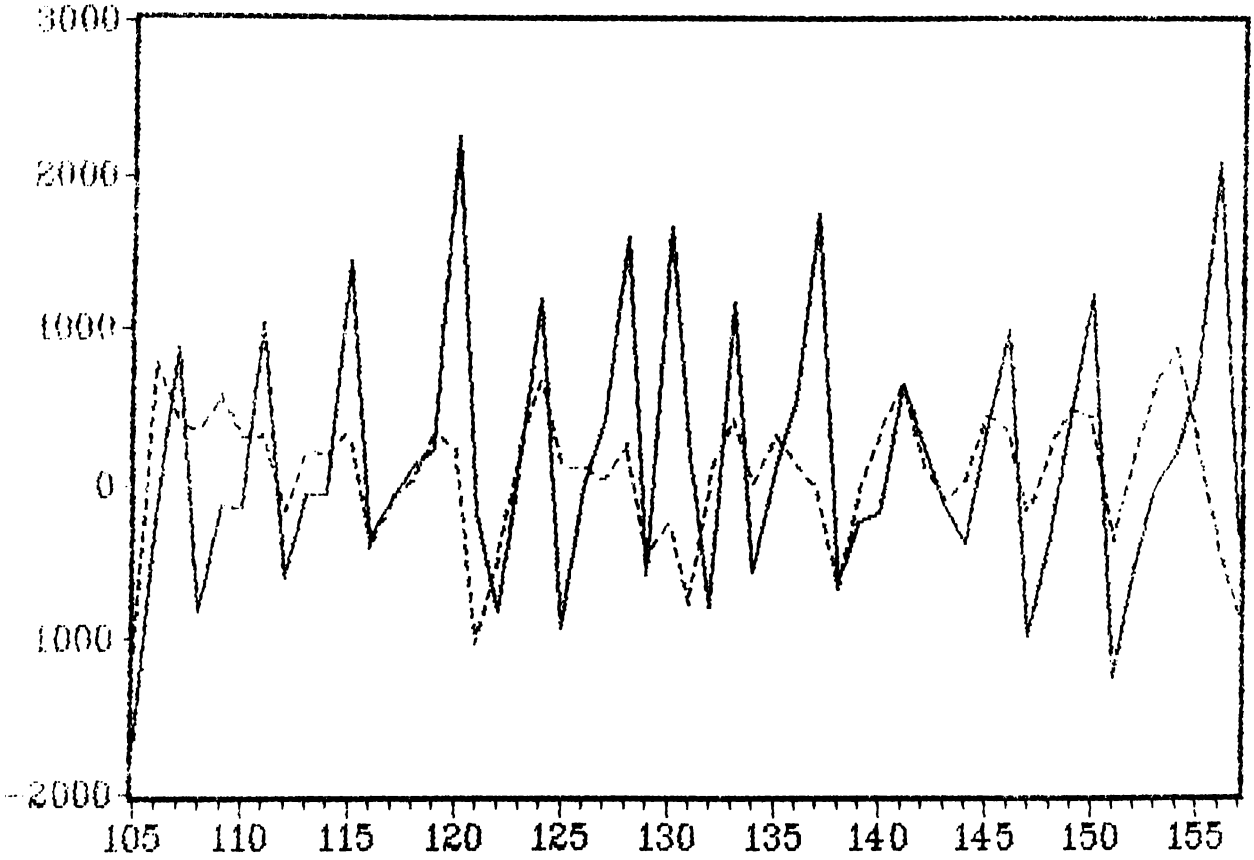
Actual and Anticipated Differences in M1



* Weekly data covering first
52 observations in 1988

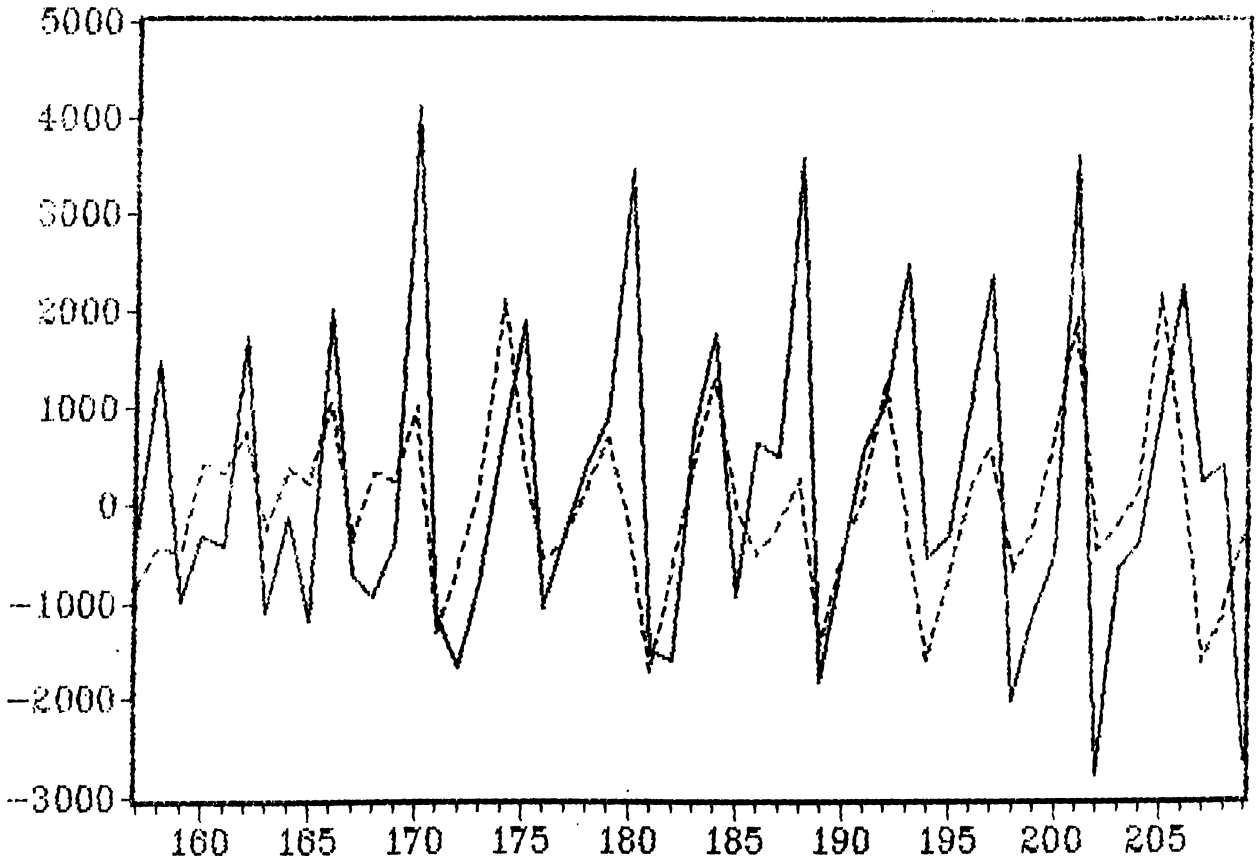
——DM1 -----DM1FRC

Actual and Anticipated Differences in M1



* Weekly data covering second
52 observations in 1989

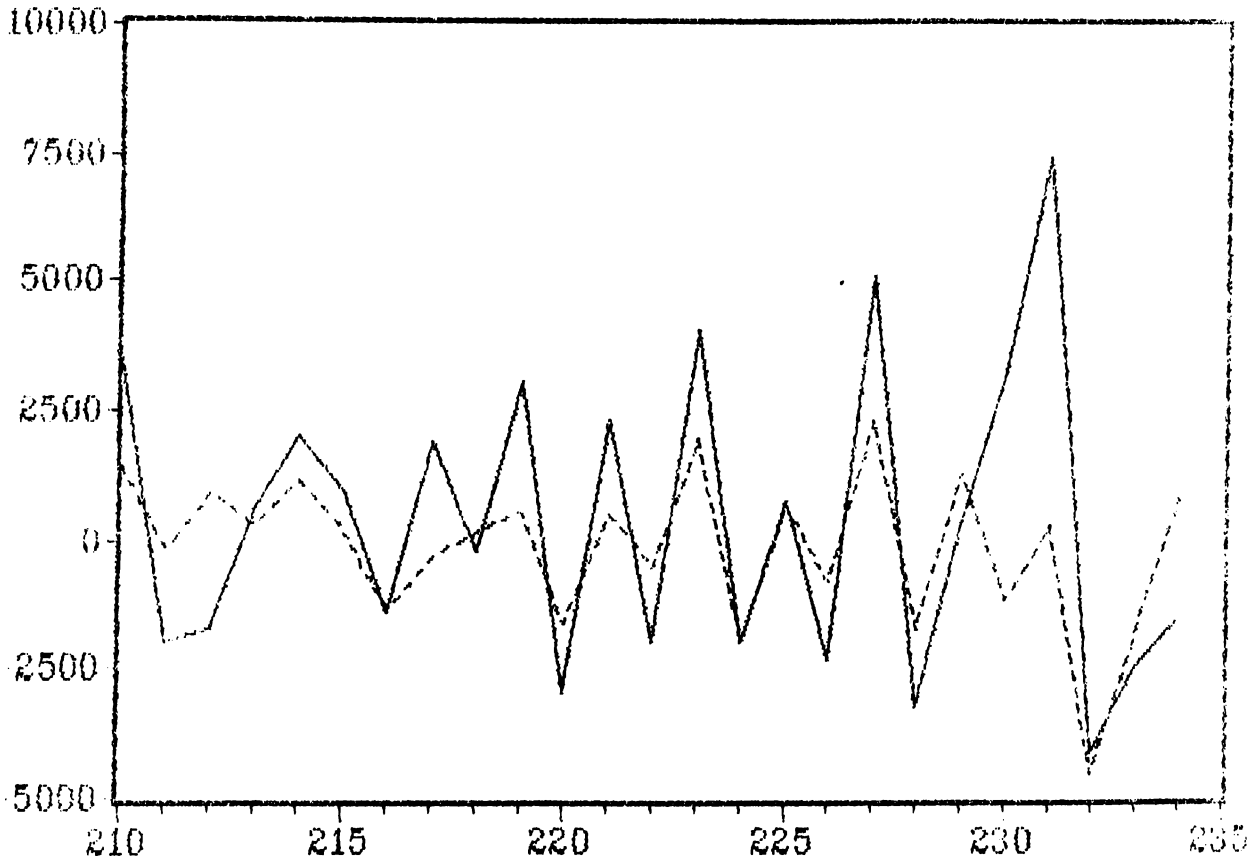
Actual and Anticipated differences in M1



* Weekly data covering third
52 observations

——— DM1 ----- DM1FRC

Actual and Anticipated Differences in M1



* Weekly data covering last 25 observations